


Article

An Analysis of Non-State and State Approaches for Forest Certification in Mexico

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Abstract: Mexico has had a non-state forest certification system under the Forest Stewardship Council (FSC) since it was initiated in 1993, and developed a new state-sponsored Mexican Forest Certification System (MFCS) that began in 2008. Several analyses have been made of FSC forest certification in Mexico, but none have summarized the new MFCS system or compared its standards with FSC. We compare the implementation of the non-state FSC market forest certification with the state-sponsored MFCS system in Mexico, and review literature on forest certification, focusing on all studies in Mexico. MFCS has had substantial enrollment of more than 902,802 ha by 2016, compared to 900,388 ha for the more-established FSC program. MFCS can be acceptable for stand-alone forest certification, and might be viewed as a stepwise path to FSC certification. The merits of both systems are analyzed in terms of standard content, likely sustainable forestry practices, access to markets, and community forestry enterprises.

Keywords: state and non-state forest certification systems; FSC; MFCS; NMX-143

1. Introduction

Public concern for the environment has grown remarkably during the last few decades, both in developed and developing countries and, as a result, environmental issues are beginning to take more of a center stage in global economic and trade policies [1]. Forest certification is a relatively new policy instrument that was introduced a couple of decades ago in order to improve environmental, social, and economic sustainability of forests. Mexico was among the first countries to adopt Forest Stewardship Council (FSC) certification in 1993, and indeed was the world headquarters for FSC from 1993 to 2003, but has seen some decline in enrollment in FSC recently. A new state forest certification program, the Mexican Forest Certification System (MFCS) was developed in 2008 in the country, and has achieved moderate enrollment levels as well. These two systems—a market-based FSC system [2] and the state-sponsored MFCS system [3]—provide an excellent opportunity to compare the merits and effectiveness of the two policy approaches.

Various authors have analyzed the policy frameworks for forest certification and its governance authority under non-state market systems [4–7], or as part of broader state, non-state, and co-regulatory certification systems [8]. The differences in co-regulation also may relate to the differences in the standards and enforcement of such policies, ranging from “hard law” sets of norms and rules generated by non-state internationally accepted forest certification systems (e.g., FSC), to “soft law” sets of voluntary environmental programs (VEPs) promulgated by industries who want to ensure sustainability and receive marketing and sales benefits (e.g., U.S. American Tree Farm System). This mix of government and market-driven certification systems has provided new mechanisms to encourage, measure, and monitor forest sustainability.

However, despite many advances in forest certification, increasing its reach and impact remains challenging. The substantial effort and cost to prepare for certification with 50 to 100 indicators or more, and extensive audits, is a barrier for organizations with less capacity and funds, either due to size or limited incomes. FSC developed a Small and Low Intensity Managed Forests (SLIMF) program to address this issue, which had a somewhat reduced set of criteria and indicators with which to measure forest certification. Some observers have suggested a reduced set of indicators for new and beginning forest enterprises. Others have focused on just implementing reduced impact logging (RIL) as a core principle for partial certification (e.g., Tropical Forest Foundation). All of these are intended either to substitute for a full and rigorous certification scheme, such as FSC, or to provide a “step-wise” approach to move uncertified firms up the path to full forest certification.

Another approach that addresses these proposals for simpler sets of certification indicators is to have government or industry develop reduced sets of indicators, and then largely pay for the costs of the certification for small- or low-capacity forestry land owners. Although not a government program, the U.S. American Tree Farm System has a simple set of 23 indicators that are then inspected only periodically by volunteers—either forest consultants, forest industry foresters, or state foresters. Government also could provide such services, and indeed Mexico started its MFCS system largely to provide a simpler set of forest certification indicators and attract new forest landowners to forest certification.

In this paper, we examine how FSC and MFCS have evolved and been implemented in Mexico, and their relative effectiveness at achieving the overall goals of measuring, monitoring, and enhancing sustainable forest management. FSC is widely accepted as providing the highest level of external market recognition for forest certification, but has been stable at best in Mexico. MFCS may provide an alternative that can achieve a large part of the same sustainability goals, at a lesser cost and effort, although its effectiveness has not been assessed. As one response, our research provides an instructive case study of examining the relevant merits of FSC as a non-state market driven system (NSMD) and MFCS as a state-sponsored government system to see how they compare in meeting environmental, social, and economic standards.

In comparing FSC and MFCS in Mexico, we posed several qualitative hypotheses for the research:

- (1) Does the NSMD certification provided by FSC improve forest management practices in Mexico?
- (2) Can the MFCS and market access for community forest enterprise processes achieve similar or sufficient sustainable forest management practices and community benefits?
- (3) Does the MFCS help move forest landowners toward full FSC forest certification?
- (4) Can the government and MFCS improve their delivery of the system?

We analyze this set of questions by (1) performing a literature review of global forest certification; (2) analyzing data on forest certification in Mexico; (3) assessing the likely Sustainable Forest Management (SFM) and community impacts by comparison of the standard requirements of the two systems in terms of content, rigor, and implementation in Mexico; and (4) developing a model to examine the merits of NSMD versus state forest certification efforts.

2. Material and Methods

2.1. Conceptual Model

Considering the MFCS as a government-sponsored policy instrument and FSC as an NSMD instrument, we drew from a map proposed by Lister [8], where the mixing and temporal sequencing of various public and private regulatory instruments at the different stages of the policy cycle constitute a co-regulatory certification system to promote sustainable forest management (Figure 1).

Lister [8] modeled forest certification as a continuum of an NSMD mechanism (see Cashore et al. [4]) to various levels of government interventions ranging from observing, cooperating, enabling, endorsing, or mandating forest certification. We adapt the two conceptual models [4,8] to examine the differences between FSC as an NSMD policy instrument and MFCS as a specific government (state)-provided forest policy instrument in Mexico.

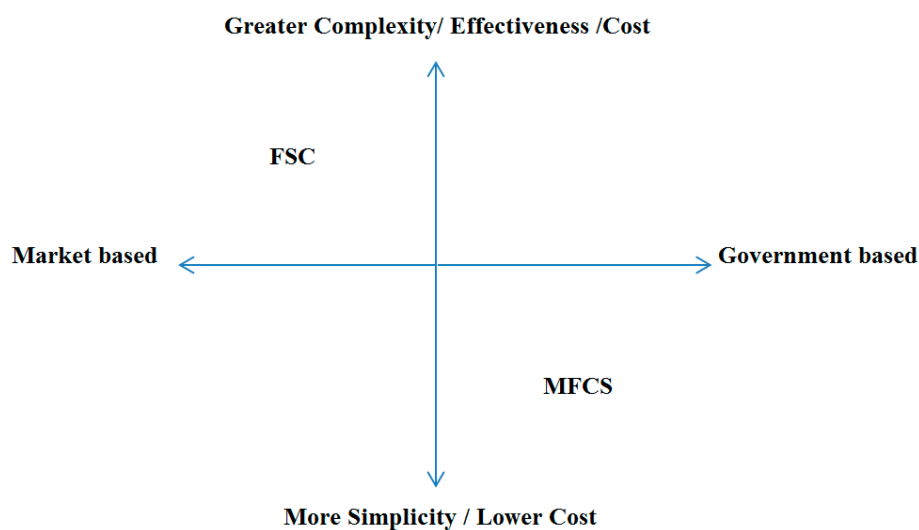


Figure 1. Conceptual Model of Forestry Certification Characteristics (FSC = Forest Stewardship Council Certification System, MFCS = Mexican Forest Certification System).

Lister [8] and Cashore et al. [4] largely examined the role of forest certification versus government regulation of forests, with varying levels of government intervention in certification. With the MFCS, the government largely goes one step farther, by actually establishing and administering the MFCS program. Thus, we are able to make a relatively unique modern comparison between a private, NSMD certification of FSC, and a state-provided forest certification system with MFCS.

Figure 1 illustrates some of the implications that we examine for Mexico. Based on its origin and reputation as an environmentally, socially, and perhaps economically rigorous standard, we hypothesize that FSC, as an NSMD approach, would have high effectiveness, with more complexity, and a greater cost. Conversely, we would hypothesize that MFCS, as a new government-provided and presumably simpler system, would have less effectiveness and less costs. These general hypotheses serve as a conceptual framework to discuss differences in the systems.

Qualitative (quality in terms of consistency, coherency, and completeness) and quantitative (number of principles, criteria and indicators) data were used to analyze positive and negative aspects from the perspective of literature review in terms of standard content, effectiveness, complexity, and cost of the certification schemes. These aspects could include economic, environmental, social, and technical changes related to pursuing or receiving certification, as well as aspects of the certification process itself [9,10].

The conceptual model, coupled with detailed program enrollment data and analysis of the principles and indicators for the two systems, also provides a means to evaluate the effectiveness of

forest certification based on a theoretical analysis and actual content of the two forest certification systems. The principles, indicators, and verifiers provide clear measures of the coverage and complexity of the two systems, and the enrollment data by system provides empirical evidence about the adoption of the systems under these different co-regulatory approaches.

These different approaches also have implications about delivery of forest certification as a policy instrument. FSC has established a global reputation for excellence and widespread market recognition and adoption as the highest level of a certification standard. The alternative Programme for the Endorsement of Forest Certification (PEFC) also has achieved global recognition and actually has more area certified now than FSC. These FSC and PEFC systems are all largely NSMD systems, although some of the PEFC systems began as government programs or were strongly advised and facilitated by the national governments in their standards establishment.

Despite the merits of NSMD forest certification under either FSC or PEFC, the level of uptake of these systems remains constrained by their complexity, cost, and rigor. All such voluntary environmental programs (VEPs) consist of some type of tradeoffs between rigor, credibility, practicality, and cost [11]. FSC in Mexico faces these issues, like all programs. It has a complex set of principles, criteria, indicators, and verifiers, which may be particularly difficult for community forest enterprises (CFEs) such as Ejidos. Despite an early start in forest certification, FSC has plateaued in Mexico, and the CFEs are seeking alternatives such as the FSC small, low intensity managed forest standard (SLIMFs). Most CFEs are too large for the SLIMF program, however, so some other FSC or state policy instrument has been sought.

The MFCS was developed at least implicitly as an alternative to the complex FSC certification, with the intent to have it as a simpler and more accessible forest certification approach for CFEs or other small owners. This system has principles, criteria and indicators, but no verifiers such as FSC recommends. MFCS represents a system with less requirements and complexity than FSC and perhaps it could be viewed as a reduced form approach to forest certification, albeit still quite substantial. MFCS also might be viewed as a stepwise approach to full NSMD certification, moving owners toward a higher level FSC standard [2]. MFCS is clearly far more rigorous than simpler state regulation of forests, with many criteria and indicators beyond simple compliance with environmental and social laws and regulations. MFCS does require compliance with laws, but also a large set of other social, environmental, and economic standards. Thus as shown in Figure 1, it could provide a government-based, simpler forest certification system than the rigorous NSMD FSC system. We also hypothesize then that MFCS may well provide all the objectives that are needed to meet sustainable forestry, although perhaps with less market benefits.

Given this conceptual model, we analyze the differences and relative merits of FSC and MFCS in Mexico using an empirical examination of the respective program objectives, standards, principles, indicators, verifiers, and extent. We examine the tradeoffs of rigor, global recognition, community practicality, and sustainable forestry impacts as criteria for evaluating the systems. We compare our Mexican findings with the literature from other countries, and make conclusions about the MFCS as a unique policy instrument in Mexico.

2.2. Data and Literature

This study was informed by a systematic data collection effort and literature review, which provided the quantitative basis and a rich qualitative context for the subsequent comparison of FSC and MFCS. We collected data on FSC and MFCS from the program web sites and personal contacts with representatives from their organizations. FSC provided data that was classified by state and type of certificate. The National Forestry Commission (CONAFOR) provided data of MFCS certification which was classified by state. For FSC, information was downloaded directly from the website, and for MFCS, information was received through email. Databases were assembled in Excel for better analysis and summary statistics.

Data on Mexican forests and community forests also came from CONAFOR and other literature. Standard bibliographic research was used, as well as literature search tools for referenced and popular articles. These included Google Scholar, data bases of Ebsco Host, Elsevier, Scopus, ACSESS DL and data bases from the National Resource Consortium for Scientific and Technological Information (CONRICYT). Searches were carried out using the virtual library of the Juarez University of Durango State (UJED).

We reviewed forest certification in Mexico via a literature search, collecting secondary and primary data about the systems from the program web sites and government officials, and from available refereed and grey literature. The review methodology included a keyword search by using the standard Google web browser (keywords used: “Forest Certification AND Mexico”, “Forest Stewardship Council” OR “Forest Stewardship Council AND Forest Certification”; “Norma Mexicana NMX-AA-143-SCFI-2008”; “Comparison of Forest Certification”; “Communal forest* AND sustainable* OR comparisons AND stewardship”, “Sustainable Forest Management AND Monitoring”), and a search of authors who have written on the topic of Forest certification or legal aspects of forest management in Mexico.

Expert advice was also used to identify primary references on the topic and the names of researchers working in the area. The sources were peer-reviewed publications including books and articles published in scientific journals, and “grey” literature, including on-line reports and popular articles that have not been reviewed by independent peers. The references in the original sources were checked for related information, and “related article” searches were also included in the data collection. Overall, more than 112 sources were identified. The search included both publications in English and Spanish. Grey literature was considered credible and was included in our paper if it was recommended by an expert or was referenced in another publication, and if it compared two or more certification systems.

3. Results

3.1. Evolution and Current State of Knowledge of Global Forest Certification

According to Rotherham [12] there are three main international forest management certification schemes in operation around the world: (i) the International Standards Organization (ISO) which is not a forest management standard as such, but a generic environmental management system standard that can apply to any forest industry; (ii) the Programme for the Endorsement of Forest Certification (PEFC); and (iii) the Forest Stewardship Council (FSC). We review FSC and PEFC briefly here.

The first functional forest certification system was administered by the FSC, established in 1993, followed by the Programme for the Endorsement of Forest Certification (PEFC) in 1999. FSC developed its own principles and criteria, while PEFC initially used different standards in different countries, mainly based on standards from the Ministerial Conference on the Protection of Forests in Europe (MCPFE) and the pan-European policy process for the sustainable management of the continent’s forests. The FSC system has adapted its general principles and criteria for national forest management standards in more than 82 countries, including Mexico [13].

According to PEFC [14], 37 countries with forest resources have their own national forest certification schemes that are endorsed under the PEFC (e.g., USA with Sustainable Forestry Initiative (SFI) and the American Tree Farm System (ATFS), Brazil-Brazilian National Forest Certification Programme (Cerflor), UK-UK Scheme for Sustainable Forest Management (UK), Canada-CSA Sustainable Forest Management Program (Canada), Sweden-Swedish Forest Certification Scheme, Finland-Finnish Forest Certification Scheme, Australia-Australian Forest Certification Scheme, PEFC-Germany, and PEFC-Russia, etc.).

As of 2016 there were 495 million hectares of forests certified in the world—PEFC and FSC with 301 million and 194 million, respectively—and 42,598 chain of custody certificates (PEFC- and FSC-certified with 10,976 and 31,622, respectively) [13,14].

Mexico has close to 65 million hectares of forests that cover about a third of the national territory. Temperate forests cover 51 percent of this area, and the remaining 49 percent are tropical forests [15]. The physical and biotic environment in these forests is highly diverse and complex [16]. The high plant species richness is complemented by a remarkable social and cultural diversity of the inhabitants living within the forest or in close vicinity. Nearly 70 percent of the forest land of the country is owned by Ejidos and Comunidades [17]. The collective land grants are known as “Ejidos”, whereas the indigenous land ownerships are called “Comunidades” [18,19]. Only approximately 15 percent of the communal forests are currently under active timber management through “Community Forest Enterprises” [20,21]. Yet, close to 85 percent of the total roundwood of the country is supplied by these two types of community enterprise [21].

Ejidos and Comunidades are rural communities that manage their forests with some level of governmental control [22]. In this context “governmental control” means that they have to practice forest management in accordance with the federal laws, mainly subject to the “Mexican Official Norm NOM-152-SEMARNAT-2006”, which specifies particular guidelines and requirements for management plans regarding the utilization of timber resources in the coniferous forests and arid regions in Mexico [23].

In Mexico, forest certification was spearheaded in the mid-1990s by two nongovernmental organizations: the Mexican Civil Council for Sustainable Silviculture (in Spanish, Consejo Civil Mexicano para la Silvicultura Sostenible in Mexico, CCMS), which focused on community forestry, and Rainforest Alliance’s SmartWood program, which is accredited as an FSC certification body [24].

Two factors drove forest certification in Mexico in the 1990s. One was a deliberate campaign by regulatory agencies, specifically the Environment Ministry (Secretaria del Medio Ambiente y Recursos Naturales, SEMARNAT), and the PROFEPA (Procuraduria Federal de Protección al Ambiente). These agencies provided a variety of economic and regulatory incentives for forest management organizations (FMOs) to obtain the FSC certification. The geographic focus of these efforts was southern Mexico, specifically Oaxaca, and to a lesser extent, Quintana Roo. The second driver of certification was market pressure. FMOs in northern Mexico, specifically in Durango and Chihuahua, were interested in FSC certification to access European markets [24].

In Mexico the first certificate in forest management was issued by the FSC in 1993 to the Ejido of Caobas, located in the municipality of Othón P. Blanco, Chetumal, Quintana Roo, and by that time some ejidos and forest communities of Durango showed an interest in certifying their forestry processes. An external evaluation to their forest management programs allowed identifying strengths, weaknesses and needs. It also gave them hope for a better price for their products on the market [25].

After FSC, ejidos, communities and government institutions such as CONAFOR, SEMARNAT and PROFEPA felt there was a need for a simple Mexican forest certification program. They cooperated to develop the MFCS standard. The Mexican Council of Forest Certification was published in September 2008 and composed by national organizations of forest producers and industrial chambers grouped in the forest business council, which aims to promote sustainable forest management and consumption of forest products from legal and certified sources.

These efforts led to the two official forestry certification standards in Mexico—the FSC Standard and the Mexican Forestry Standard NMX-AA-143-SCFI-2008. In Mexico the FSC certification program uses a specific generic standard and is implemented by a Rainforest Alliance/SmartWood certification body, while the Mexican certification program has also its own generic standard [26] and is implemented by accredited foresters. Both generic standards are consistent with the FSC principles and criteria, but the assessment indicators are different for each scheme.

The Mexican certification system was created as a unified strategy that incorporates the existing forest certification instruments in a single institutional policy to promote good forest management in Mexico. It was promoted by the institutions responsible for the national forest development (CONAFOR and SEMARNAT).

The generic standard of the Mexican Official Standard: NMX-AA-143-SCFI-2008 has a twofold objective: (i) technical: to assess the forest management, ensuring compliance with the economic, social functions and ecological forestry; and (ii) commercial: improved market access and distribution of products from certified forests. The system was developed by the Mexican Accreditation Entity (EMA) which in turn authorizes the Association for Standardization and Certification (ANCE) as the certification body. In November 2011 the first forest company property Sánchez Monroy y CIA, S de RL de CV was certified, in the state of Jalisco, through the Mexican system.

3.2. Forest Area Certified in Mexico

Table 1 shows the number of forest management organizations and the forest areas currently certified in Mexico by federal state and the two schemes operating in the country. In the Americas, Mexico ranks sixth in the number of FSC-certified hectares and sixth in number of chain of custody certificates issued [13].

Table 1. Number of companies with forest management certifications in Mexico under FSC and MFCS Schemes, 2016.

State	FSC Standard			MFCS		
	FMOs (no.)	Area (ha)	Percent	FMOs (no.)	Area (ha)	Percent
Durango	22	396,662.8	44	59	392,700.9	43
Chihuahua	3	297,028	33	28	408,135.4	45
Oaxaca	4	74,752.3	8	5	34,212.4	4
Jalisco	3	9501.0	1	5	18,659.2	2
Guanajuato	1	2120.7	0	7	16,203.6	2
Puebla	20	15,741.2	2	16	10,893.2	1
Estado de Mexico	4	3366.0	0	6	7766.0	1
Hidalgo	2	932.3	0.1	19	12,289.8	1
Michoacán	2	12,655.1	1	2	1341.2	0
Quintana Roo	2	46,022.5	5	0	0.0	0
Veracruz	1	3273.0	0	0	0.0	0
Chiapas	2	2951.9	0	0	0.0	0
Campeche	1	25,000.0	3	0	0.0	0
Veracruz y Tabasco	1	10,380.0	1	0	0.0	0
Tlaxcala	0	0.0	0	1	600.3	0
TOTAL	68	900,389	100	148	902,802	100

Source: based on data from [23,24]; FMOs = forest management organizations; FSC = Forest Stewardship Council; MFCS = Mexican Forest Certification System.

As of 2016, a total of 900,388.69 hectares had been certified in Mexico in 68 forest management organizations (FMOs) for both sustainable forest management and chain of custody under the FSC scheme [27]. Certificates issued by FSC were issued in FMOs in 14 federal states in Mexico, where Durango with 396,662.80 certified hectares, accounted for 44 percent of the national total (Table 1). Regarding the MFCS under the NMX-AA-143-SCFI-2008, there were 148 certificates of sustainable forest management issued in ten states corresponding to 902,802.08 hectares of forests [28].

In both forest certification systems operating in Mexico (FSC and MFCS) Durango stands out as the state with the largest certified area. This can be explained because it is the state that provides more than 25 percent of the total roundwood to the country, and most of the exports, basically high-grade sawnwood, come from this region [29].

Of the total forest area certified in forest management in the world, 64.7 percent are private tenure, 23.05 percent are public properties, 9.99 percent corresponds to concessions and only 2.2 percent to communities [30]. These findings are opposite to the situation in Mexico, where 70 percent of the forest area is owned by ejidos and comunidades, while 26 percent consists of private property, and 4 percent

is national forests [17]. On the other hand the existence of a greater number of certifications in chain of custody in the private property is explained by the fact that a large number of ejidos and communities in Mexico do not have sawmills to process their timber.

3.3. Comparison of the Implementation of the Two Certification Systems in Mexico

Both FSC and MFCS use the terms ‘principles’, ‘criteria’ and ‘indicators’ to describe the values of sustainable forest management. Table 2 shows the administrative similarities of implementation of the two certification systems operating in Mexico. Both systems are similar at this first level of comparison. This similarity may be explained by the fact that MFCS incorporated a number of management requirements directly from the FSC standard.

Table 2. Comparison of FSC and MFCS Forestry Certification Structures in Mexico.

Certification Systems	FSC	MFCS
Year established	1993	2008
Primary scope	Worldwide; All forest ownership types	All forest ownership types in Mexico
Fee	Yes	Yes
System is performance based	Yes	Yes
Basis for participation	Voluntary	Voluntary
Issues covered by standard	Environmental, silviculture, economic and social	Environmental, silviculture, economic and social
Eco-label implemented	Yes	Yes
Number of principles of forest management	10	9
Number of criteria to support the principles	56	46
Number of indicators to support the criteria	160	135
Number of specific verifiers to assess the criteria	405	None
Documentary review of forest management plans	Yes	Yes
Inspection of field practices and conditions	Yes	Yes
Agency acting as Third Party Audits	Rainforest Alliance	Asociación de Normalización y Certificación ANCE
Types of certificates granted	Forest Management Chain of custody Controlled wood	Forest Management
Certified hectares in Mexico	900,388	902,802

Source: based on data from the [26,30].

Key differences between the two systems are the number of criteria and indicators. FSC has 55 criteria supporting its ten principles, while MFCS has 46. There is also a considerable difference among the certification systems in the amount of indicators supporting the criteria; FSC had 160 versus 135 in MFCS. And unlike the MFCS, the FSC uses also the term ‘verifier’ which should provide specific details that would indicate or reflect a desired condition of the indicators. FSC has 405 verifiers while MFCS does not use verifiers.

Another difference between the two systems is the lack of a chain of custody certificate in the MFCS. The MFCS does not cover the full process of acquisition, transfer, handling and disposition of the material. It would instead need to rely on other mechanisms to ensure originality and legality, such as forest harvesting permits, transport documentation, invoices, or sales tickets at mills. Thus, FMOs certified under the FSC scheme are better suited to access global markets, while those certified by the MFCS can now only improve their image in the domestic markets [31].

Table 3 compares the specific certification standards between the FSC and MFCS in Mexico. Because the MFCS was drawn from the criteria and indicators of the FSC, there are many similarities between the two. For example, principle 1 of FSC (compliance with laws and principles of FSC) has a strong relationship with 6 principles of the MFCS (1, 2, 3, 4, 5 and 6) (66.6 percent of its principles), while principle 1 of MFCS (the forest land is legally constituted) aligns with seven of the FSC principles (1, 2, 3, 4, 5, 6 and 7) (70 percent of its principles). However, each certification system differs in how it interprets the criteria and indicators.

Table 3. Comparison of Specific Certification Standards between FSC and MFCS in Mexico.

FSC Principle	Main Indicator Linkages to MFCS	MFCS Principle	Main Indicator Linkages to FSC
1. Compliance with laws and principles of FSC: (Criteria: 6, indicators: 15, verifiers: 40)	With 1, 2, 3, 4, 5 and 6	1. The forest land is legally constituted: (Criteria: 5, indicators: 7)	With 1, 2, 3, 4, 5, 6 and 7
2. Tenure and use rights and responsibilities: (Criteria: 3, indicators: 8, verifiers: 20)	With 1 and 3	2. The forest property has records of inputs and outputs of forest raw materials: (Criteria: 4, indicators: 8)	With 1, 2, 7 and 9
3. Indigenous peoples' rights: (Criteria: 4, indicators: 8, verifiers: 25)	None	3. The forest estate shows a commitment to the conservation of the forest ecosystem and maintains compliance with regulations in force: (Criteria: 4, indicators: 12)	With 1, 6, 7 and 9
4. Community Relations and Worker Rights: (Criteria: 5, indicators: 15, verifiers: 47)	With 6 and 7	4. Forest land observes the regulations and takes action to prevent and mitigate adverse effects from logging: (Criteria: 11, indicators: 41)	With 6, 7 and 9
5. Benefits from the forest: (Criteria: 6, indicators: 20, verifiers: 61)	With 2, 3, 6 and 9	5. The forest keeps records and applies procedures to ensure the verification of volumes and the legal origin of forest raw material: (Criteria: 4, indicators: 15)	With 1, 4, 5 and 9
6. Environmental Impact: (Criteria: 10, indicators: 33, verifiers: 94)	With 4 and 8	6. The Company or Forest land provides adequate working conditions for workers: (Criteria: 9, indicators: 20)	With 1, 3, 4, 5, 6, 7 and 8
7. Management Plan: (Criteria: 4, indicators: 14, verifiers: 26)	With 3, 4, 8 and 9	7. Forest land maintains relations of respect and cooperation with local communities within, or adjacent to land under forest management: (Criteria: 3, indicators: 8)	With 1, 2, 3, 4, 5 and 6
8. Monitoring and Assessment: (Criteria: 5, indicators: 14, verifiers: 25)	With 8	8. Forest land has established a procedure for monitoring and evaluation of impacts to vegetation, wildlife, water quality and soil: (Criteria: 3, indicators: 16)	With 1, 2, 4 and 8
9. Maintenance of high conservation value forests: (Criteria: 4, indicators: 9, verifiers: 18)	None	9. Forest land incorporates socioeconomic aspects that contribute to sustainable management of forest resources: (Criteria: 3, indicators: 9)	With 1, 3, 7 and 8
10. Plantations: (Criteria: 9, indicators: 24, verifiers: 49)	With 3, 4 and 8	Not applicable	

Interpretation: principle 1 of FSC relates with 6 principles of the MFCS (1, 2, 3, 4, 5 and 6), while principle 1 of MFCS relates with 7 principles of the FSC (1, 2, 3, 4, 5, 6 and 7).

Unlike the FSC, the MFCS does not have the principles about indigenous peoples' rights, maintenance of high conservation value forests, and plantations. This means that the nine principles of the MFCS are equally applicable to indigenous and non-indigenous people, forests containing or not

high conservation values, and to native forests and plantations, but do not have any specific indicators that assess these components of SFM. Social criteria of tenure rights and community relations each have similar principles in FSC and MFCS. Multiple benefits from the forest and environmental impact also have analogs in each system, as does monitoring and assessment. Almost all the MFCS indicators have some linkage to the FSC indicators, although they are scattered among different FSC principles.

There are issues that are not discussed in as much depth in the MFCS as in FSC, such as the use of an accounting system for control of the economic incomes of the *ejido* or *comunidad*, diversification of production for the penetration of new markets, and increasing the value of forest services. The use of genetically modified organisms is not clearly regulated either. Moreover, the MFCS does not mention the relationship with international treaties related to forest management; and it does not mention the rights of workers to organize and voluntarily negotiate with their employers. MFCS relies on the 46 criteria with 135 indicators alone as sufficient for the audit process. This leaves more discretion to the certification body to determine compliance and provides more flexibility to owners than does the case of FSC, which supplements the 56 criteria and 160 indicators with 405 verifiers through which instruments will be used to determine compliance with each indicator [31].

Figure 2 shows a comparison of the number of indicators identified by the FSC and MFCS in Mexico. There is considerable variation at this third level of comparison. The FSC and MFCS are not based on similar conceptual grouping, so do not align well, as shown in Table 2. This looks even more apparent as shown in Figure 2. Thus while a number of indicators are similar between the two systems, they are scattered across many different principles.

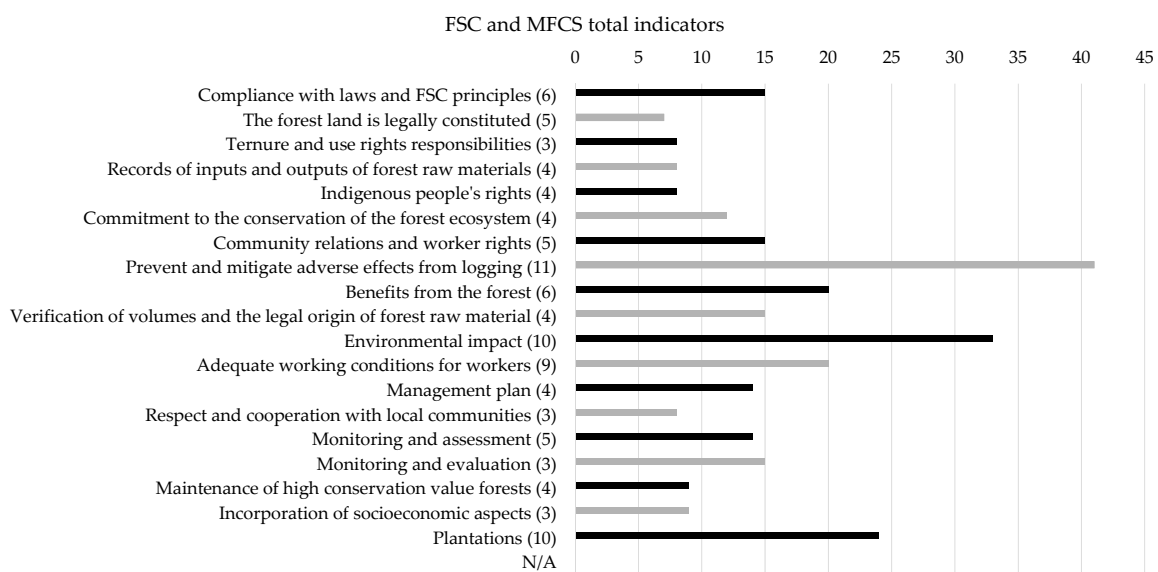


Figure 2. Certification assessment requirements by FSC and MFCS. Interpretation: FSC principle 1: “Compliance with Laws and FSC Principles” is supported by 6 criteria (number given in parentheses). This principle has 15 requirements that forest managers in Mexico will be assessed (black bar), while principle 1 of MFCS: “The forest land is legally constituted” is supported by 5 criteria (number given in parentheses) and will be assessed with 7 indicators (grey bar). Source: based on data from [26,30].

Examining the individual indicators, FSC has more indicators (>10) that address environmental impacts (42), plantations (24), multiple benefits from the forest (20), compliance with laws and FSC principles (15), monitoring and assessment (14), management plans (14), and community relations and workers’ rights (12). MFCS has the most indicators (>10) related to preventing adverse effects from logging (41), adequate working conditions for workers (20), commitment to conservation of the forest ecosystem (15), monitoring and evaluation (15), and verification of volume and legal origin (15). The two systems are roughly equal in the number of their indicators (<10) that cover other components,

such as forest land legality, tenure, and indigenous rights; high conservation value forests; monitoring and assessment; and respect and cooperation with local communities.

3.4. Conceptual Model to Examine the Merits of NSMD-FSC System Versus MFCS Efforts

Recall that we proposed a two-factor, four-cell conceptual model to delineate the differences between non-state and state forest certification systems into quadrants based on rigor and costs. This model and the data on principles and indicators and adoption assessed the merits of FSC and MFCS in Mexico. The model is relatively straightforward, and presages how one would think the two systems differ, with FSC being more rigorous and expensive than MFCS. This detailed analysis does, however, provide considerably more insight into why these outcomes in fact do occur, and their degree of importance. Initially, it suggests that the NSMD system [8] as applied in Mexico is more appropriate for larger and more savvy FMOs, while the MFCS, a government-sponsored program [4], is more apt to facilitate entry and participation of small owners.

Many policy-makers and market actors are engaged in developing and implementing innovative interventions that aim to increase the sustainability of commodity production to enhance environmental, economic or social outcomes [32,33]. In general, differences in the co-regulatory structures of certification schemes, and differences in the scale of standard-setting, reflect differences in the framing of citizens and subjects of equity. In the case of the FSC, the focus is on empowering non-producers to influence forest management through a hierarchy of global and regional standards with prescriptive requirements that aim to prevent industry practices from harming the environment, indigenous people's rights, and to a lesser degree workers and local communities. This approach affords producers more influence over management priorities and helps reduce the cost of certification, particularly for small-scale operators who lack economies of scale [6].

4. Discussion

4.1. Program Components in Mexico

In theory forest certification should generate better economic returns since it provides access to new markets. It should ensure that the costs generated by the better forest management operations are covered by a better price of certified products [34]. The case of Mexico is especially interesting since 70 percent of the forest area of the country is communal social property (owned by ejidos and comunidades) [17]. Global statistics on the type of ownership of land certified by FSC show that 50 percent is private, 47 percent public and only 3 percent is communal. The prominent role of Mexico in the community forestry is evident, and when analyzing the geographical distribution of certified community forests, Mexico stands as the leading country with 35 percent of the total area worldwide [25].

The Standard of the MFCS (NMX-AA-143-SCFI-2008) was adopted after the international certification FSC, and its requirements are aligned to the FSC. However, it is important to mention that the MFCS considers already the modifications derived from a review process of the Principles and Criteria (P&C Version 5) of FSC performed in 2012. The biggest changes were the modification of Principle 10, formerly dedicated to plantations (whose indicators are now spread over the rest of principles) and now to the implementation of management activities, and expanding the concept of Forests with High Conservation Value (Principle 9) for the most generic and broad of High Conservation Values. Furthermore, FSC also developed a set of International Generic Indicators (IGIs), in order to help forest managers, stakeholders and certification bodies interpret the new P&C for a specific region. Eventually, the FSC Standards in each country must be transferred to the FSC P&C Version 5 (P&C V5), but they will not apply to Mexico until a few more years.

The comparison between FSC and MFCS performed in this paper showed several differences between the two systems, which may affect the impact of forest certification in Mexico. While the number of principles is slightly different, their coverage and the indicators in each of those does not

align directly between the FSC and MFCS system, and FSC has slightly more indicators, as well as a unique large set of verifiers. MFCS delegates more authority to CFE (Community Forest Enterprises). The verifiers would seem to ensure more rigor and a more thorough uniform audit process among different properties and certification bodies. However, for small or less-organized properties and owners, the many verifiers may seem too rigorous and difficult, and could represent a barrier to participate in the process. Furthermore extensive detail may provide many opportunities for the certification body to think about small details that could trigger non-conformances or corrective actions. However, this perceived flexibility with MFCS standards does not guarantee that forest properties with national certification meet the rigorous FSC forest management requirements, so MFCS is apt to appeal less for international certification. Since the MFCS standard was adjusted to the conditions of Mexican forests, it should consider very specific characteristics of national forest management such as the interaction with indigenous communities and conditions of Mexican forests. In comparison, since there are mostly communal properties, FSC pursues this through more thorough universal FSC indicators that address environmental impacts, multiple benefits from the forests, and compliance with laws and FSC principles.

In Durango, MFCS has 37 more certified properties than FSC, but FSC has more certified forest area (396,662.8 ha.). This finding indicates that smallholdings in Mexico are opting for the national forest certification, while the community forests prefer the international scheme. This appears to confirm early concerns about the limited ability of small forests to achieve certified forest management in the global South [35–37]. This finding also confirms Guthman's [38] observation, who reported that incentive-based and voluntary regulation can fail to motivate environmental improvement when competition and the dynamics of land rents combine to dissipate organic price premiums [39]. In this sense the MFCS should focus its efforts on the properties of low intensity because the certification of small forest operations still remains a challenge. In 2009 Mexico recorded only 3 FSC forest certification operations of this type [40], and currently there are 27 certificates [30]. To continue to encourage community forests and operations of small or low-intensity forests, the FSC has developed a number of special considerations with the purpose of making forest certification more accessible for small forest owners, however it seems that most FMOs in Mexico are too large for this forest certification scheme.

4.2. Program Effectiveness

MFCS was at least partially proposed as a stepwise approach to FSC [2]. It has as its principal instrument the Mexican Standard NMX-AA-143-SCFI-2008. As part of the system, it has the Auditoria Técnica Preventiva (ATP) under Article 113 of the General Law on Sustainable Forestry Development. This policy tool is a legal precursor of the MFCS, since it requires an audit to ensure compliance with forest and environmental Mexican law. It helps in preparing and promoting forest producers to voluntarily access national certification and possibly move up to international FSC certification. In this sense MFCS is seen as a path leading gradually to achieve international FSC certification. FSC has key specific requirements that owners have to accomplish at the beginning of the process: (a) to have a management plan; (b) the management plan must be authorized by SEMARNAT; and (c) the management plan fully complies with the market requirements.

Despite the importance of forest certification, Mexico and all countries debate whether certification has improved sustainable management of forests or the environmental, economic and social practices, and if the benefits justify the costs required [41]. According to Karmann and Smith [42], in countries such as Brazil, Bolivia, Mexico and the United States, certification has brought access to better markets and higher prices for their products. On the other hand, retailers are often the most powerful actors in wood commodity chains, and they generally have little interest in either increasing the cost of the products to consumers or in passing any increased revenue back to their certified suppliers [35,37,39,43]. Forest certification has not achieved a widespread price benefit for certified forest producers [39]. Mexico is an appropriate country to be explored as to whether certification is meeting these objectives, being a pioneer in the field of certification and leader in Latin America and the Caribbean, ranking

sixth in total hectares certified in forest management in the Americas, and sixth in number of chain of custody certificates [30].

While forest certification remains one of the main policy instruments for assessing the long-term sustainability of the world's forest resources, the impacts on the forest management systems undergoing certification remain vastly understudied [44], and only a few studies have documented in detail the impacts of forest certification on the overall quality of the operations of companies such as forest management [42,45,46]. However, evaluations of complex, large-scale, and long-term conservation interventions like FSC certification will also be expensive because, if well-done, they will require participation of many stakeholders, extended time in the field by well-informed observers, and substantial buy-in by governments [47]. According to Tamarit [48], forest certification had not contributed to socio-economic development, or to the reduction of deforestation and degradation of forests in Mexico. The main reasons are related to weak administrative and business skills of Ejidos and Comunidades, low access to markets, and inadequate organization schemes.

However, producers and experts indicate that even though the certification of good forest management has not yielded more income for Ejidos and Comunidades, it has had other benefits that are noteworthy. These include a change of attitude of foresters, showing greater conviction by the proper care and management of their forests and, especially, the presence of well-managed and conserved forests, with the consequent positive environmental impacts [34].

Global demand for wood from responsibly managed forest has increased. Since 2007 the Mexican government has required wood originating from certified forestry operations. The General Procurement Law was amended then to give preference to producers to ensure sustainable use of forest in buying wood, furniture and office supplies. This represents an opportunity for forests and forest industry in Mexico, given this position of the authorities, since local buyers would have first preference. In addition, major Mexican production companies have also committed to certification and now buy and consume a very large volume of certified wood and forest products. Some examples are Maderas Oriente, Artes Gráficas Panorama, Pochteca Papel, Dixon and Stanley.

Certification also provides an opening to better financing possibilities. Institutions offering donations or loans for the development of projects to maintain or promote responsible forest management may ask for FSC certification as a requirement. The reason is simple; the FSC certification ensures a long-term commitment for responsible forest management. For example, since 2004 the bank HSBC has had a global policy requiring all employers in the forestry cluster to use certified products as a condition for accessing the bank's financial services [49].

A very important benefit of forest certification in Mexico has been that it improves chances of getting government support. Some government agencies may consider the FSC logo as a guarantee of commitment to responsible forest management. More communities with FSC certification have received government financial or technical support compared to communities without certification [40]. As an example, the operating rules of PRONAFOR, the Mexican program that offers economic incentives to the forest owners for promoting forest management, give better scores to the requests of certified forest properties [50]. On the other hand, the SEMARNAT practices less-intensive revisions for forest management plans of communities with FSC certification in comparison to others that do not have it, and consequently they get the authorization in a very short period of time.

Certification systems allow consumers to directly influence forest management by purchasing certified products. As demand for certified products increases, so does the pressure on forest companies to become certified to maintain their market share [5]. Citizens assume that certified forest products come from sustainably managed forests, making certification a de facto "quality assurance" mechanism for the sustainability performance of a forest product.

In addition, forest certification develops and improves the public image of the forestry companies, and consensus within the community about how to manage the forest is encouraged. Policies and rules and regulations of forest communities can be clarified, and land rights and better public image of the forestry company may occur. Despite the disappointment with the lack of price

premium, certificate holders indicate overall high satisfaction with market access. In addition to market access, most managers and land owners were satisfied with the performance of non-economic benefits: forest management and practices, management systems and performance, self-discovery of non-conformances, better communication, and public confidence [51].

Demand for certified wood is growing, however in Mexico price premiums have not materialized yet. Thus, current local eco-sensitive markets do not appear to be sufficient to promote forest certification in the country. In many industrialized countries, effective enforcement of forestry regulations leads to a small gap between actual forestry practices and certification standards. Consequently, there are small opportunity costs to conforming to certification standards. In contrast, poor environmental law enforcement in most developing countries—the original impetus for NSMD forest certification—arguably creates a formidable hurdle for certification that requires full compliance with relatively rigorous laws on paper.

4.3. Differences in the Conceptual Model

According to an in-depth comparison, the FSC includes more mandatory and detailed requirements than the MFCS to maintain natural forest ecosystems and species diversity and prevent the conversion of natural forests to plantations. These requirements can be understood as addressing “distributive equity” in that they prioritize benefits for natural ecosystems and biodiversity [52].

In relation to the MFCS, according to the provisions of the Federal Law on Metrology and Standardization, in order to allow Mexican Standards (NMX) and Mexican Official Standards (NOM) to be reviewed and updated every five years, the process was completed and Mexico has a new version of the Mexican Standard MNX-AA-143-SCFI-2015, or Mexican Standard for Sustainable Forest Certification, which will allow the recognition by the international organization “Program for the Recognition of Forest Certification Systems” (PEFC).

Forest producers, who are certified by MNX-AA-143-SCFI-2015, will have the opportunity to request, through a Specialized Council, the International PEFC certification. Although it is a process that has not started, this initiative will force it to seek to meet higher quality standards [53].

Regardless of how schemes frame equity through standard-setting, the global distribution of certificates largely mirrors existing inequalities in trade. Trends in the implementation of certification may reinforce this with all schemes shifting from relational approaches towards adoption of ISO procedures that favor corporate participation [44].

FSC is recognized nationally and internationally by different actors in the supply chains of forest products, from producers to their commercialization stage, thus FSC certification ensures more recognition and opening of market opportunities at international level. Although the FSC was certainly not the first to initiate third-party audits, by doing so it influenced the design of other conservation interventions. Even more broadly, the FSC helped gain credence for conservation based on sustainable forest management, which will be a challenging impact to measure [47].

To date MFCS is only recognized in Mexico, and especially by the government. MFCS lacks a chain custody certificate, which impedes recognition and acceptance in key green markets such as Europe and Japan. However, international standards and laws, such as FLEG-T and the U.S. Lacey Act, can help ensure originality and legality. In Mexico, sale invoices of the material coming from forest harvesting may be a sufficient legal guarantee for the national and local markets, which may be the focus of MFCS.

Forest certification is an important instrument that permits market actors to express social and environmental values. It does require forest managers to make important improvements to forest management where it is adopted. Its ability to spread broadly and achieve those desired changes equitably is limited by consumer demands and large retailers. Forest certification can improve the ability of some of the largest Mexican producers to compete in export markets [39].

In Mexico, certification is emerging as a key aspect in measuring progress of environmental concerns and the development of the instruments of government and environmental incentives.

The strengths in this area include a large number of cases of ejidos and comunidades certified with a large area; the availability of institutions and qualified technical personnel; the incorporation of this instrument in public policies such as government procurement; and the inclusion of this concept in governmental programs [32].

5. Conclusions

The merits of FSC versus MFCS in Mexico depend on the case of application, costs, market acceptance, and effectiveness in achieving SFM objectives. FSC aims are higher and more difficult to achieve. MFCS provides more attainable standards, but our analysis indicates that it has significant rigor and large proportion of indicators similar to FSC. For improving SFM on small forest properties, MFCS may well be sufficient. It also may begin as a path to more comprehensive FSC certification future for ejidos and comunidades. They could try MFCS and see if the organizational processes and field implementation were manageable, and then seek more rigor and costs with FSC to help enter international timber markets. In contrast, some FSC properties may revert to MFCS as a more accessible standard, rather than drop out of certification completely.

FSC will surely provide the strongest seal for all international markets. MFCS may be sufficient for Mexican markets as noted. FLEG-T, LITES, RIL and other international agreements also may provide legal assurance for international markets when coupled with MFCS. The systems are likely to remain relatively different, and MFCS will need to examine its level of rigor versus practicality as it competes with FSC and tries to gain more market recognition. Conversely, in order to expand in Mexico, FSC will need to find means to be more accessible to small landowners, with less complexity. Our analysis here can help the systems consider their relative merits and prospective revisions in the future.

FSC is the accepted international standard in Mexico, but may be hampered by excessive standards and costs, and most applicable to large FMOs with considerable organizational capacity. Many FMOs sometimes find it difficult to meet the FSC standard because of, among other things, their weak administrative and business skills, low access to markets and information on these, and inadequate organization schemes. Thus, ejidos and comunidades in Mexico find FSC forest certification demanding in the short term, unless they receive some short-term to intermediate government incentive or market benefit to justify the costs. MFCS offers a less intensive but still relatively rigorous and credible alternative to FSC. It may be particularly appropriate for small forests and for domestic markets.

MFCS, eight years after its creation, also could include more to pave the way for those properties that aspire to an international certification, and create a chain of custody certificate by MFCS as a development tool for the forestry industry. However, our analysis suggests that there still is a relatively large gap between the rigor and widespread international acceptance of FSC and the credible but largely Mexican-oriented MFCS.

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